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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 09/896,689	Applicant(s) JACQUES, ROBERT
	Examiner Joshua C Liu	Art Unit 2121

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amendment forwarded on 3/9/2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *26-28, 30 and 35* is/are allowed.

6)☒ Claim(s) *1-5,7-17,19-25,29,31-34,36-39 and 42-44* is/are rejected.

7)☒ Claim(s) *6,18,40 and 41* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 22, 31, 33, 37-39, and 42 are objected to as the claims fail to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claims 22, 31, 33, 37-39, and 42 recite "a controller 'of the type'" in the preamble, which render the claims indefinite.

2. Claims 39 and 40 are objected to because of the following informalities:

- "Means for injection" in claim 39 appears to recite "means for injecting".
- Claim 40 recites "the means for generating" on L. 2, which lacks antecedence.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3, 5, 7, 10, 12-15, 17, 29, 32, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Underwood (US Patent Number 5,299,459; Issued 4/5/1994) in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000).

Claim 1

Claim 1 recites

A system for controlling the physical behavior of an apparatus, the behavior of the apparatus estimated by an initial behavioral model, the system comprising:

(a) a sensor element located in proximity to the apparatus for acquiring data indicative of the physical behavior of the apparatus;

(b) a system processor which includes a tunable controller based on the initial behavioral model, the processor capable of generating a drive signal, estimating a behavioral model, tuning and adjusting the controller and generating a control signal,

(c) wherein the processor adapts the initial model to an updated model based upon the acquired data, combines the updated model with a universal filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model, and

(d) wherein the control signal generated by the processor according to the controller is used to control the physical behavior of the apparatus.

- Regarding claim 1, Underwood teaches an adaptive motion control system comprising:

(a) (Underwood Fig. 1 Elements 12 and 32; Col 4 L. 46-48, "the sensors measure the resultant response.");

(b) a digital processing subsystem (Underwood Fig. 1 Element 24) which includes a controller (Underwood Col 3 L. 17-20, "However, the controller… drive signals accordingly.") based on the initial behavioral model (Underwood Col 3 L. 6-12, "Briefly, the preferred… reference spectral vector."), the processing system capable of generating a drive signal (Underwood Col 2 L. 50-55, "Accordingly,… near structural resonance."), estimating a behavioral model (Underwood Col 3 L. 6-12, "Briefly, the preferred… reference spectral vector."; Col 5 L. 22-26, "Initial values… at each sensor."), and generating a control signal (Underwood Col 5 L. 33-36, "The second comparator… feed-back loop.").

(d) wherein the control signal generated by the processor according to the controller is used to control the physical behavior of the apparatus (Underwood Col 2 L. 50-68, "Accordingly… structure under test.").

However, Underwood does not teach that (b) the system comprises a tunable controller, (c) wherein the system adapts the initial model to an updated model based upon the acquired data, combines the updated model with a universal filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model. Gagne teaches a system for controlling the operation of a processing apparatus comprising (b) a tunable controller (Gagne Fig. 4 and 11; ¶225), wherein the system adapts the initial model to an updated model based upon the acquired data, combines the updated model with a filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to have a tunable controller, wherein the system adapts an initial model to an updated model based upon the acquired data, combines the updated model with a filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model.

Claim 2

- Regarding claim 2, see §103 rejection of claim 1, *supra*, and (Underwood Col 2 L. 50-68, "Accordingly… structure under test.").

Claim 3

- Regarding claim 3, see §103 rejection of claim 1, *supra*, and (Underwood Col 6 L. 36-39, "The inventor has… control problem theory.").

Claim 5

- Regarding claim 5, see §103 rejection of claim 1, *supra*, and (Underwood Col 5 L. 10-18, "The control response vector… vector values."; Fig. 2 Element 36, "Reference Spectrum Matrix").

Claim 7

- Regarding claim 7, see §103 rejection of claim 1, *supra*, and (Underwood Fig. 1 Element 24; Col 4 L. 60-Col 5 L. 10, "Referring now to… the present invention.").

Claim 10

- Regarding claim 10, see §103 rejection of claim 1, *supra*, and (Underwood Col 1 L. 6-12, "The present invention… acceptable limits."; Col 3 L. 17-20, "However, the controller… drive signals accordingly."; Col 3 L. 61-65, "The inventive method… other test parameters."), wherein the system begins acquiring data when testing is initiated.

Claim 12

- Regarding claim 12, see §103 rejection of claim 1, *supra*, and (Underwood Fig. 1 Elements 26-32; Col 4 L. 46-48, "When the exciters… resultant response."). Underwood's *exciters* are *actuators*. IEEE defines an actuator as "a component that provides a physical output in response to a stimulating variable or signal" (Breitfelder Pg.

16). Underwood's exciters "may be any of the commonly available linear or rotary types of electromechanical exciter devices" (Underwood Col 4 L. 41-43; See also Col 4 L. 35-40). Electromechanical devices provide a physical output in response to a stimulating electrical signal. Therefore, Underwood's exciters are actuators.

Claim 13

- Regarding claim 13, see §103 rejection of claim 12, *supra*, and (Underwood Fig. 1 Elements 26-32; Col 4 L. 46-48, "When the exciters... resultant response."; Col 4 L. 56-59, "Analog response signals... digital processing system.").

Claim 14

- Regarding claim 14, see §103 rejection of claim 13, *supra*, and (Underwood Col 3 L. 61-65, "The inventive method... frequency, or with other test parameters."; Col 4 L. 46-48, "When the exciters... the resultant response."), wherein the purpose of Underwood's adaptive motion control system is to test, among other physical characteristics, the frequency of large or complex structures, and (Underwood Col 5 L. 44-61, "In mathematical terms... first test cycle."), wherein the functioning of the digital signal processing depends on *f*, or frequency of the system.

Claim 15

- Regarding claim 15, see §103 rejection of claim 1, *supra*, and (Underwood Fig. 2 Elements 38 and 50, and Elements labeled as "First Comparator" and "Compensated Error Matrix"; Col 5 10-35, "The control response... feed-back loop."), wherein the digital processing subsystem compares, compensates, and filters signal from the sensor. IEEE defines *signal conditioning* as "sensor processing involving operation such as

amplification, compensation, filtering, and normalization (Breitfelder Pg. 1048).

Therefore, the digital processing subsystem includes a signal conditioner.

Claim 17

- Regarding claim 17, see §103 rejection of claim 1, *supra*, and (Underwood Col 6 L. 36-42, "The inventor has... control dilemma.").

Claim 29

Claim 29 recites

A method for controlling movement of a mechanical apparatus based on the spatial location of a movable portion of the mechanical apparatus, the movement of the portion initially estimated by a first mathematical model and governed by a first controller which is based on the first mathematical model and a mathematical filter, comprising the steps of:

(a) introducing a first signal to induce motion in the movable portion;

(b) measuring the motion and spatial location of the movable portion in response to the first signal;

(c) updating the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller, such that the motion induced when a second signal is applied to the mechanical apparatus is well-predicted.

- Regarding claim 29, Underwood teaches a method for adaptive motion control, comprising the steps of:

(a) (Underwood Fig. 1 Elements 12 and 32; Col 4 L. 46-48, "the sensors measure the resultant response.");

(b) (Underwood Fig. 1 Element 14; Col 4 L. 48-59, "When the exciters... digital processing system.");

However, Underwood does not teach (c) updating the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second

controller, such that the motion induced when a second signal is applied to the mechanical apparatus is well-predicted. Gagne teaches a method for controlling the operation of a processing apparatus comprising the step of (c) updating the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller, such that the motion induced when a second signal is applied to the mechanical apparatus is well-predicted (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to update the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller.

Claim 32

Claim 32 recites

A system for controlling the physical behavior of an apparatus, the behavior of the apparatus estimated by an initial behavioral model, the system comprising:

(a) a sensor element located in proximity to the apparatus for acquiring data indicative of the physical behavior of the apparatus during a period when the apparatus is not in normal operation;

(b) a system processor which includes a tunable controller based on the initial behavioral model, the processor capable of generating a drive signal, estimating a behavioral model, tuning and adjusting the controller and generating a control signal,

(c) wherein the processor adapts the initial model to an updated model based upon the acquired data, combines the updated model with a universal filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model, and

(d) wherein the control signal generated by the processor according to the controller is used to control the physical behavior of the apparatus.

- Regarding claim 32, Underwood teaches an adaptive motion control system comprising:

(a) (Underwood Fig. 1 Elements 12 and 32; Col 1 L. 6-8, "The present invention... a vibration test."; Col 2 L. 50-54, "Accordingly,... structural resonance."; Col 4 L. 46-48, "the sensors measure the resultant response.");

(b) a digital processing subsystem (Underwood Fig. 1 Element 24) which includes a controller (Underwood Col 3 L. 17-20, "However, the controller... drive signals accordingly.") based on the initial behavioral model (Underwood Col 3 L. 6-12, "Briefly, the preferred... reference spectral vector."), the processing system capable of generating a drive signal (Underwood Col 2 L. 50-55, "Accordingly,... near structural resonance."), estimating a behavioral model (Underwood Col 3 L. 6-12, "Briefly, the preferred... reference spectral vector."; Col 5 L. 22-26, "Initial values... at each sensor."), and generating a control signal (Underwood Col 5 L. 33-36, "The second comparator... feed-back loop.").

(d) wherein the control signal generated by the processor according to the controller is used to control the physical behavior of the apparatus (Underwood Col 2 L. 50-68, "Accordingly... structure under test.").

However, Underwood does not teach that (b) the system comprises a tunable controller, (c) wherein the system adapts the initial model to an updated model based upon the acquired data, combines the updated model with a universal filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model. Gagne teaches a

system for controlling the operation of a processing apparatus comprising (b) a tunable controller (Gagne Fig. 4 and 11; ¶225), wherein the system adapts the initial model to an updated model based upon the acquired data, combines the updated model with a filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to have a tunable controller, wherein the system adapts an initial model to an updated model based upon the acquired data, combines the updated model with a filter to create a relation that describes the behavior of the apparatus and creates a controller based on the relation such that the controller is tuned according to the updated model.

Claim 36

Claim 36 recites

A method for controlling movement of a mechanical apparatus based on the spatial location of a movable portion of the mechanical apparatus, the movement of the portion initially estimated by a first mathematical model and governed by a first controller which is based on the first mathematical model and a mathematical filter, comprising the steps of:

(a) introducing a first signal to induce motion in the movable portion during a period of time when the mechanical apparatus is not in normal operation;

(b) measuring the motion and spatial location of the movable portion in response to the first signal;

(c) updating the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller, such that the motion induced when a second signal is applied to the mechanical apparatus is well-predicted.

- Regarding claim 36, Underwood teaches a method for adaptive motion control, comprising the steps of:

  (a) (Underwood Fig. 1 Elements 12 and 32; Col 1 L. 6-8, "The present invention… a vibration test."; Col 2 L. 50-54, "Accordingly,… structural resonance."; Col 4 L. 46-48, "the sensors measure the resultant response.");

  (b) (Underwood Fig. 1 Element 14; Col 4 L. 48-59, "When the exciters… digital processing system.");

  However, Underwood does not teach (c) updating the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller, such that the motion induced when a second signal is applied to the mechanical apparatus is well-predicted. Gagne teaches a method for controlling the operation of a processing apparatus comprising the step of (c) updating the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller, such that the motion induced when a second signal is applied to the mechanical apparatus is well-predicted (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view

of Gagne, to update the first mathematical model to generate a second mathematical model which approximates the motion of the movable portion and updating the first controller using the second mathematical model and the filter to create and solve an optimal control problem and thereby generate a second controller.

5. Claims 4, 19-21, 25, 34, and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Underwood (US Patent Number 5,299,459; Issued 4/5/1994), in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Jacques (IDS Reference C1).

Claim 4

- Regarding claim 4, see §103 rejection of claim 3, *supra*.

However, Underwood in view of Gagne does not teach that the relation is solved by a method chosen from the group of methods consisting of: linear quadratic gaussian (LQG), H-infinity and mu-synthesis. Jacques teaches that LQG, H-infinity, and mu-synthesis --provide optimal control algorithms (Jacques Pg. 34 L. 8-22, "Rovner and Cannon… the frequency response."), and are robust (Jacques Pg. 34 L. 19-20, "For robust control… or mu-synthesis.). Furthermore, the Applicant admits in Detailed Description on Pg. 8, L. 20-24 that Linear Quadratic Gaussian, H-infinity, mu-synthesis and hybrids thereof are typical analytical methods for resolving optimal control problems. Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, and further in view of

Jacques, by using Linear Quadratic Gaussian, H-infinity, or mu-synthesis as optimal control algorithms to resolve optimal control problems.

Claim 19

- Regarding claim 19, see §103 rejection of claim 1, *supra*.

However, Underwood in view of Gagne does not teach that the processor creates the updated model by non-linear curve-fitting thereby describing the updated model by a known mathematical equation according to the data gathered by the sensor. Jacques teaches that an updated model can be created by non-linear curve-fitting thereby describing the updated model by a known mathematical equation according to data gathered by the sensor (Jacques Pg. 58 L. 15-17, "The resulting model… high precision model."), --which are designed to solve the non-linear square problem and minimize cost function (Jacques Pg. 83 L. 8-11, "In curve fitting,… sum of quadratic values."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, and further in view of Jacques, by having the digital signal processor create updated model using non-linear curve-fitting thereby describing the updated model by a known mathematical equation according to data gathered by the sensor.

Claim 20

- Regarding claim 20, see §103 rejection for claim 19, *supra*, and (Jacques Equation 3.101; Pg. 94 L. 11-24, "The most commonly…, (3.101)."), wherein the cost or error function is associated with the known mathematical equation, the error function including log magnitude and phase information, --as the log error function is insensitive to transfer

function magnitude and hence will give better fits for the zeros (Jacques Pg. 95 L. 1-7, "This cost function... the additive cost."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, and further in view of Jacques, by using an error function that is associated with the known mathematical equation, the error function including log magnitude and phase information.

Claim 21

- Regarding claim 21, see §103 rejection of claim 13, *supra*.

However, Underwood does not teach an equation for determining the logarithmic error between the collected data and the initial behavioral model. Jacques teaches an equation for determining the logarithmic error between the collected data and the initial behavioral model (Jacques Equation 3.101; Pg. 94 L. 11-24, "The most commonly..., (3.101)."), wherein the logarithmic error between the collected data and the initial behavioral model is a vector of parameters which describes the model, --as the log error function is insensitive to transfer function magnitude and hence will give better fits for the zeros (Jacques Pg. 95 L. 1-7, "This cost function... the additive cost."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Jacques, by using a logarithmic error function as claimed.

Claim 25

Claim 25 recites

A method for governing motion in a physical system, the physical system being estimated by an initial behavioral model, comprising the steps of (a) inducing motion in the physical system, (b) measuring frequency data which characterizes the motion in the system, (c) updating the initial behavioral model to

create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a universal filter to create a command structure and (e) applying appropriate stimulus to the system to cause motion in the physical system, thereby causing the physical system to behave in accordance with the command structure.

- Regarding claim 25, Underwood teaches a method for adaptive motion control of a physical system, comprising the steps of:

  (a) (Underwood Fig. 1 Elements 26 and 30; Col 4 L. 46-48, "When the exciters… the sensors measure the resultant response.");

  (b) (Underwood Fig. 1 Elements 12, 28, and 32; Col 3 L. 61-65, "The inventive method… other test parameters."; Col 4 L. 46-48, "the sensors measure the resultant response.");

  (e) applying the control signal generated by the processor according to cause motion in the physical system (Underwood Col 2 L. 50-68, "Accordingly… structure under test.").

  However, Underwood does not teach (c) updating the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a universal filter to create a command structure. Gagne teaches a method for controlling the operation of a processing apparatus comprising the steps of (c) updating the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a filter to create a command structure (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to update the initial behavioral model to create an

updated behavioral model which accurately conforms to the measured data and use the updated behavioral model in conjunction with a filter to create a command structure.

Claim 34

Claim 34 recites

A method for governing motion in a physical system, the physical system being estimated by an initial behavioral model, comprising the steps of (a) inducing motion in the physical system, (b) measuring frequency data which characterizes the motion in the system during a period when the physical system is not in normal operation, (c) updating the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a universal filter to create a command structure and (e) applying appropriate stimulus to the system to cause motion in the physical system, thereby causing the physical system to behave in accordance with the command structure.

➢ Regarding claim 34, Underwood teaches a method for adaptive motion control of a physical system, comprising the steps of:

(a) (Underwood Fig. 1 Elements 26 and 30; Col 1 L. 6-8, "The present invention… a vibration test."; Col 2 L. 50-54, "Accordingly,… structural resonance."; Col 4 L. 46-48, "When the exciters… the sensors measure the resultant response.");

(b) (Underwood Fig. 1 Elements 12, 28, and 32; Col 3 L. 61-65, "The inventive method… other test parameters."; Col 4 L. 46-48, "the sensors measure the resultant response.");

(e) applying the control signal generated by the processor according to cause motion in the physical system (Underwood Col 2 L. 50-68, "Accordingly… structure under test.").

However, Underwood does not teach (c) updating the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a universal filter to create a command structure. Gagne teaches a method for controlling the operation of a processing apparatus comprising the steps of (c) updating the initial behavioral model to

create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a filter to create a command structure (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to update the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data and use the updated behavioral model in conjunction with a filter to create a command structure.

Claim 42

Claim 42 recites

A method for selecting a controller of the type used by a user to govern motion in a physical system comprising:
(a) injecting motion control signals to govern motion in the physical system having feedback to a controller injecting the motion control signals;
(b) disabling the controller and substituting a temporary control signal generator injecting preselected control signals into the physical system to enable measurement of response to the preselected control signals;
(c) generating an update of a preexisting model of the physical system based upon the measured responses;
(d) using the updated model along with a universal filter for generating a new controller by computing new controller variables; and,
(e) connecting the new controller to the physical system.

- Regarding claim 42, Underwood teaches a method for adaptive motion control of a physical system, comprising the steps of:

  (a) (Underwood Fig. 1 Elements 26 and 30; Col 1 L. 6-8, "The present invention… a vibration test."; Col 2 L. 50-54, "Accordingly,… structural resonance."; Col 4 L. 46-48, "When the exciters… the sensors measure the resultant response.");

  (b) (Underwood Fig. 1 Elements 12, 28, and 32; Col 1 L. 6-8, "The present invention… a vibration test."; Col 2 L. 50-54, "Accordingly,… structural resonance."; Col 3 L. 61-65,

"The inventive method… other test parameters."; Col 4 L. 46-48, "the sensors measure the resultant response.");

(e) applying the control signal generated by the processor according to cause motion in the physical system (Underwood Col 2 L. 50-68, "Accordingly… structure under test.").

However, Underwood does not teach (c) updating the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a universal filter to create a command structure. Gagne teaches a method for controlling the operation of a processing apparatus comprising the steps of (c) updating the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data, (d) using the updated behavioral model in conjunction with a filter to create a command structure (Gagne Fig. 4, 11, 17A-B, 18D; ¶47-50, ¶203, ¶215, ¶225), in order to – provide greater stability, robustness, and adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to update the initial behavioral model to create an updated behavioral model which accurately conforms to the measured data and use the updated behavioral model in conjunction with a filter to create a command structure.

Claim 43

Claim 43 recites

The method of claim 42 further comprising:
The step of generating a new controller includes downloading the computed new controller variables to the existing controller.

Regarding claim 43, see §103 rejection of claim 42, *supra*, and (Gagne Fig. 1-2, 4, 11, and 17A; ¶203; ¶217; ¶240) in order to – provide greater stability, robustness, and

adaptability (Gagne ¶4, ¶159-160). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, to generate a new controller by downloading the computed new controller variables to the existing controller.

Claim 44

Claim 44 recites

The method of claim 43 further comprising:
The new controller variables are controller gains.

Regarding claim 44, see §103 rejection of claim 43, *supra*.

6. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Underwood (US Patent Number 5,299,459; Issued 4/5/1994), in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Robinson (US Patent Number 5,968,187; Issued 10/19/1999).

Claim 8

- Regarding claim 8, see §103 rejection for claim 1, *supra*.

However, Underwood in view of Gagne does not teach a second processor in data communication with the digital processing subsystem. Robinson teaches a computer system including a second processor (Robinson Fig. 1 Element 136; Fig. 2 Element 258; Col 2 L. 26-29, "One feature... the docking station."), which –provides additional processing power to the second processor and allows for remote connection of the second processor to the digital processing subsystem (Robinson Col 2 L. 30-35, "Another feature... stationary portion."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of

Gagne, and further in view of Robinson, by adding a second processor in data communication with the digital processing subsystem.

Claim 9

- Regarding claim 9, see §103 rejection for claim 8, *supra*, and (Robinson Fig. 1 Element 136; Fig. 2 Element 258), wherein the second processor (Robinson Fig. 1 Element 136; Fig. 2 Element 258; Col 2 L. 26-29, "One feature… the docking station.") is portable from the location of the digital processing subsystem, which –provides additional processing power to the portable second processor and allows for remote connection of the second processor to the digital processing subsystem (Robinson Col 2 L. 30-35, "Another feature… stationary portion."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, and further in view of Robinson, by adding a second processor that is portable from the location of the digital processing subsystem.

7. Claims 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Underwood (US Patent Number 5,299,459; Issued 4/5/1994), in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Yamunachari et al. (US Patent Number 5,930,476; Issued 7/27/1999).

Claim 11

- Regarding claim 11, see §103 rejection of claim 10, *supra*.

However, Underwood does not teach that the predefined event is an event selected from the group of events consisting of: input received from an operator, exceeding a threshold operating value in the apparatus, and the passage of a predetermined length of

time. Yamunachari teaches that predefined events is an event selected from the group of events consisting of: inputs received from an operator (Yamunachari Fig. 4; Col 2 L. 11-17, "Apparatus for automatically... associated even request."), exceeding threshold operating value in the apparatus (Yamunachari Fig. 4; Col 3 L. 19-23, "For example,... exceeding a threshold."), and the passage of a predetermined length of time (Yamunachari Fig. 4), which –allows for monitoring of devices (Yamunachari Col 2 L. 1-13, "A computer storage medium... predefined event requests."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, and further in view of Yamunachari, by acquiring data upon occurrence of an event selected from the group of events consisting of: inputs received from an operator, exceeding threshold operating value in the apparatus, and the passage of a predetermined length of time.

8. Claims 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Underwood (US Patent Number 5,299,459; Issued 4/5/1994), in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Araie et al. (US Patent Number 5,523,953; Issued 6/4/1994).

Claim 16

- Regarding claim 16, see §103 rejection of claim 1, *supra*.

However, Underwood does not teach that the digital process subsystem includes a signal amplifier. Araie teaches usage of an amplifier (Araie Fig. 1 Element 34; Col 4 L. 67-Col 5 L. 2, "The temperature detector... from the thermosensors."), which –isolates the sensor elements from the digital processing subsystem and amplifies signals from the

sensor elements (Araie Col 4 L. 67-Col 5 L. 2, "The temperature detector… from the thermosensors."). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to modify Underwood, in view of Gagne, and further in view of Araie, by including a signal amplifier in the digital process subsystem.

Response to Arguments

Specification

9. The Applicant has addressed the Examiner's objection to the specification.

Double Patenting

10. The Applicant has addressed the Examiner's double patenting rejections by filing a terminal disclaimer.

Claim Objections

11. The Applicant has addressed the Examiner's claim objections in Paper No. 8.

12. Claims 6, 18, and 40-41 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 101

13. The Applicant has fully addressed the Examiner's §101 rejections. The §101 rejection of claims 27-28 has been withdrawn.

Claim Rejections - 35 USC § 112

The Applicant has addressed the Examiner's §112 rejections in Paper No. 8. The §112 rejection of claims 18 and 23-24 has been withdrawn.

Response

14. Applicant's arguments, see Pg. 16-22, filed 3/9/2004, with respect to the rejection(s)of claims 1-3, 5, 7, 10, 12-15, 17, and 25 under §102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Underwood (US Patent Number 5,299,459; Issued 4/5/1994) and further in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000).

15. Applicant's arguments, see Pg. 24, filed 3/9/2004, with respect to the rejection(s)of claims 4 and 19-21 under §103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Underwood (US Patent Number 5,299,459; Issued 4/5/1994), Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Jacques (IDS Reference C1).

16. Applicant's arguments, see Pg. 24, filed 3/9/2004, with respect to the rejection(s)of claims 8-9 under §103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Underwood (US Patent Number 5,299,459; Issued 4/5/1994), in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Robinson (US Patent Number 5,968,187; Issued 10/19/1999).

17. Applicant's arguments, see Pg. 24-25, filed 3/9/2004, with respect to the rejection(s)of claim 16 under §103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Underwood (US Patent Number 5,299,459; Issued 4/5/1994), in view of Gagne (US

Patent Publication Number 2002/0,016,640; Filed 6/30/2000), and further in view of Araie et al. (US Patent Number 5,523,953; Issued 6/4/1994).

18. Applicant's arguments, see Pg. 22, filed 3/9/2004, with respect to claims 26-28 have been fully considered and are persuasive. The §102(b) rejection of claims 26-28 has been withdrawn.

19. Applicant's arguments, see Pg. 23, filed 3/9/2004, with respect to claim 30-31 have been fully considered and are persuasive. The §102(b) rejection of claim 30-31 has been withdrawn.

Allowable Subject Matter

20. Claims 6, 18, 22-24, 26-28, 30, 31, 33, 35, 37, and 38-41 are allowed.

21. The following is an examiner's statement of reasons for allowance:

- Regarding claims 26-28 and 30, see applicant's arguments with regards to these claims.
- Claim 35 recites limitations identical to those in allowed claim 26, and further recites an additional narrowing limitation on L. 5-6 that the step of gathering data relating to the motion characteristics of the system when the system is not in normal operation based upon preselected induced control signals.
- Regarding patentability of claims 40-41, the prior art taken alone or in combination fails to teach the claimed invention of a system for creating a controller to govern motion in a physical system, comprising controller means for injecting preselected control signals, means for generating an update of a preexisting model of the physical system based upon the measured response to the control signals, and means for using the updated model along with a universal filter to generate a new controller.

  The closest prior art, Underwood (US Patent Number 5,299,459; Issued 4/5/1994) in view of Gagne (US Patent Publication Number 2002/0,016,640; Filed 6/30/2000), does

not teach means for using the updated model along with a universal filter for generating a new controller means as recited in claim 39. The closest prior art teaches an adaptive motion control system comprising: controller means for injecting test signals to induce motion in the physical system and means for generating an update of a preexisting model of the physical system based upon the measured response to the control signals.

However, the closest prior art does not fairly suggest means for using the updated model along with a universal filter for generating a new controller means as set forth in the written description. Therefore, claimed invention improves the adaptive motion control system by having the means for using the updated model along with a universal filter for generating a new controller means as set forth in the written description.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joshua C Liu whose telephone number is (703) 305-6435. The examiner can normally be reached on Monday-Friday, 8:30am-5:15pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight, can be reached on (703) 308-3179. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

jl

Anthony Knight
Supervisory Patent Examiner
Group 3600